

Project No. 3074
File: 3074.4

JULY MONTHLY PROGRESS REPORT
MONTANA DOT “PERFORMANCE PREDICTION MODELS”

Monthly Progress Report To:	Susan Sillick, MT DOT Jon Watson, MT DOT
Agency:	Fugro-BRE
Contract No.:	HWY-30604-DT
Prepared By:	Harold Von Quintus
Date Prepared:	August 10, 2001

1.0 CURRENT MONTH WORK ACTIVITIES AND ACCOMPLISHMENTS

The project initiated on June 12, 2001. The activities completed during the months of June and July are reported in this first Monthly Progress Report.

A meeting was held on July 2nd in Helena MT with the project staff of Harold Von Quintus (Fugro-BRE) and Dick Moore (P-B) and various Montana DOT personnel that may be involved in various stages of this work. A set of meeting minutes was produced and submitted to the DOT on July 10 for review and concurrence.

The July 2nd meeting minutes are attached to this report. A set of the visual aids was provided to the DOT. The project team provided the Department with a list of contact team individuals in July.

Task 1 – Literature Review

The literature review was initiated by reviewing all distress prediction models being considered by and those that are being incorporated into the 2002 Design Guide under NCHRP 1-37A, as well as all of the distress prediction models that are being used in development of the NHI Course on Introduction to Mechanistic-Empirical Design.

Task 2 – Review of MT DOT Pavement-Related Data

As a result of the July 2nd meeting, various information and data were obtained from the MT DOT for possible use in planning the experimental design and data collection activities. Specifically, information on the pavement management database, deflection testing, distress surveys, longitudinal profile testing, and construction information was obtained from the MT DOT and reviewed by the project team. The different types of typical pavement cross-section and materials used for flexible pavements also were obtained from the MT DOT. This information is being used to plan and finalize the experimental design and factorials of Task 3. In addition, the specific types of HMA mixtures were identified for each of the LTPP projects in Montana. This information is needed and will be used in developing the final experimental factorial.

As part of the July 2nd meeting, the project team was given authorization to review and possibly include those LTPP projects in States adjacent to Montana to supplement the number of projects included in the experimental factorial. These test sections were identified and extracted

from the LTPP database. Pavement cross-sections, materials, climatic conditions, and subgrade soils were reviewed to select those projects that have similar conditions to the ones encountered in Montana. These projects were tentatively identified and included in the draft experimental factorial. This list of adjacent LTPP sites will be provided to the Department when the final experimental factorial is submitted for review as part of Task 3.

The project personnel discussed the traffic data and location of the traffic sites with our traffic consultant, Dr. Mark Hallenbeck. Both project personnel and Dr. Hallenbeck have contacted Mr. Dan Bisom with the MT DOT to ensure that we have a correct understanding on the traffic data that has been collected and stored along the various roadways in Montana.

Project personnel have obtained and extracted traffic data, materials data, climatic data, soils data, and other information from all of the a LTPP sites located in Montana. A list of missing data was provided to the Department for coordinating with LTPP to obtain this data. The project staff provided a listing of the missing data to Mr. Jon Watson in preparation for the Department's meeting with the LTPP Regional Coordination Office to determine the status of this missing data. One of the areas of concern is that there are no weighing-in-motion data in the LTPP traffic data tables. The missing traffic data were discussed with Mr. Bisom.

Task 3 – Establish the Experimental Factorials

A draft experimental factorial and testing plan was provided to the Department during the July 2nd meeting. As part of the experimental factorial, all of the LTPP sites adjacent to Montana have been reviewed and information extracted from the LTPP database to determine which of those sites have similarities to Montana conditions and thereby can be included in the experimental factorial. In addition, information on the Department pavement-related data was submitted to our project consultants in preparation for a meeting that is to be held in early August to review all activities conducted to date and to establish and finalize the experimental factorials.

Task 4 – Develop Work Plan for the Monitoring and Testing Plans

No activity.

Task 5 – Presentation of Work Plan to MT DOT

No activity.

Task 6 – Implement Work Plan – Data Collection

No activity.

Task 7 – Data Analyses and Calibration of Performance Prediction Models

No activity.

Task 8 – Final Report and Presentation of Results

No activity.

2.0 PROBLEMS/RECOMMENDED SOLUTIONS

No problems were encountered during the months of June and July and none are anticipated for next month.

3.0 NEXT MONTH'S WORK PLAN

The activities planned for next month are identified and discussed below.

- Completion of the literature review and review of all distress prediction models. This information will be submitted to the Department in the form of a Technical Memorandum near the end of August.
- Meeting with project consultants to discuss the literature review, various pavement-related data used by the Department in preparation of the experimental design, and the selection of additional test sections to complete the experimental factorial. A set of meeting minutes from this meeting with the consultants will be submitted to the Department for review. In addition, the results from the meeting with the Department will be used to finalize the experimental design and testing plan as well as finalizing the work plan for the performance monitoring and laboratory testing plans under Task 4.
- The experimental factorials and design will be completed and submitted to the Department near the end of August. This final experimental factorial will identify all sites to be included in the monitoring program. These include the existing LTPP sites in Montana and in adjacent States and those test sections that will be added to the program this year.
- A draft of the monitoring and testing work plan will be completed and submitted for review to the Department under Task 4.
- It is expected that the presentation of the work plan to the Department will be made during the latter part of August or early September. This presentation will be scheduled with the Department during August.

4.0 FINANCIAL STATUS

Following is a summary of the estimated expenses incurred during the months of June and July. Accumulated expenses for the project, estimated through the end of the month are represented graphically in the attached line chart.

Cost Element	Previous Month's Cumulative Cost, \$	Current Monthly Expenditures (Estimated), \$	Cumulative Costs (Estimated), \$
Direct Labor	0	3,015	3,015
Overhead	0	4,311	4,311
Consultants/Subcontractors	0	0	0
Travel	0	1,777	1,777
Testing	0	0	0
Other Direct Costs	0	12	12
Fee	0	911	911
Total Costs	0	10,026	10,026

The following table provides a summary of the total expenditures by the Montana and FHWA fiscal years in comparison to the allocated funds for each fiscal year.

Maryland DOT Fiscal Year				FHWA Fiscal Year		
Fiscal Year		Allocated Funds Cumulative, \$	Expenditures Cumulative, \$	Fiscal Year		Expenditures Cumulative, \$
6/1-6/30	2001	15,000	0*	6/1-9/30	2001	65,000
7/1-6/30	2002	218,969	10,026	10/1-9/30	2002	258,969
7/1-6/30	2003	348,969	---	10/1-9/30	2003	358,969
7/1-6/30	2004	388,969	---	10/1-9/30	2004	398,969
7/1-6/30	2005	428,969	---	10/1-9/30	2005	438,969
7/1-6/30	2006	498,969	---	10/1-9/30	2006	498,969
TOTAL		498,969	10,026			498,969
						10,026

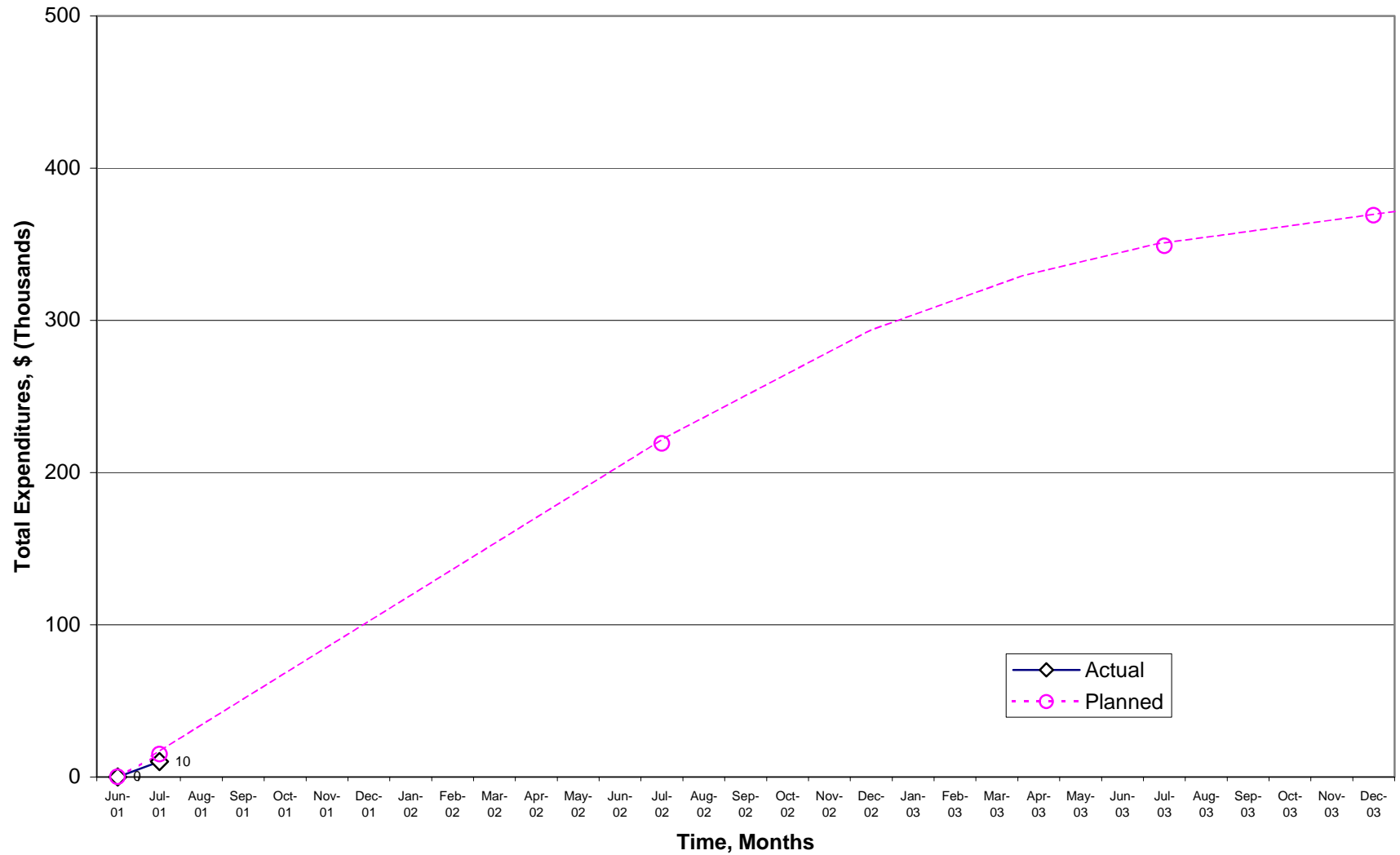
*June 2001 expenditures were combined with July 2001 expenditures.

CC: Brian Killingsworth, Fugro-BRE
 Starr Kohn, SME
 Dick Moore, P-B
 Amy Simpson, Fugro-BRE
 Weng-On Tam, Fugro-BRE

Monthly Progress Report - Financial Status

Contractor: Fugro-BRE
Montana DOT: "Performance Prediction Models"
Fugro-BRE Project No.: 3074

Contract No.: HWY-30604-DT



PROJECT TITLE “PERFORMANCE PREDICTION MODELS”
PROJECT NUMBER HWY-306041-DT

MEETING MINUTES

Meeting Date: 2 July 2001

Meeting Location: Montana DOT Conference Room, 3rd Floor

Attendees

Name	Organization	Phone Number
Harold L. Von Quintus	Fugro-BRE, Inc.	512/977-1800
Dick Moore	PB	406/443-9171
Jon Watson	MDT-Pavement Analysis	406/444-7260
Susan Sillick	MDT-Research	406/444-7693
Jim Tompkins	MDT-Surfacing	406/444-6295
Bob Weber	MDT-Construction	406/444-6014
Ed Shea	MDT-Surfacing	406/444-7650
John K. Amestoy	MDT-NDT	406/444-7651
Paul Cogley	MDT-NDT	406/444-7651
Greg Kovich	MDT-Pavement Mgmt.	406/444-6149

The following summarizes specific points and comments made during the meeting relative to the experimental plan and coordination of work plan activities. A copy of the agenda is attached to this set of meeting minutes.

1. Items Provided at the Meeting.

- a. A copy of the LTPP database for the Montana test sections was provided to the project team. This CD was sent from LTPP based on the letter requesting the data measured on Montana’s test sections included in LTPP.
- b. A map of Montana showing the district boundaries and roadway system maintained by the Department.
- c. A map of Montana showing the type and location of the traffic measuring devices.
- d. A copy of “Montana Pavement Management System – Manual of Rating Instructions.”
- e. Handouts included a copy of the presentation material used by the project team.

2. Administrative Items. The project team must not go over the annual budget estimated for the Department. All progress reports, technical reports, and financial reports should be sent to Susan Sillick. She will distribute to their technical panel and others as appropriate. Susan Sillick requested that the invoice periods not bridge either the State (July to June) or Federal (October to September) fiscal years.

3. General Discussion of “Road Map”. The project team gave an overview of the Road Map and work plan – task activities and schedule. The following summarizes the comments and suggestions made by MtDOT personnel.

- a. The four major distress types are the ones to consider in the experimental plan. These include fatigue cracking (both surface initiated and bottom initiated surface cracks), thermal cracking, rutting or permanent deformation, and ride quality.
 - b. It is permissible to use the LTPP test sections in adjacent states, as long as the construction, climate and materials are not significantly different. The project team will prepare a listing of those sites and submit to the Department for review. This submission will be completed near mid-July.
 - c. The criteria used as trigger values, to determine when to rehabilitate flexible pavements depends on both extent and magnitude of each distress. The values to be used for each distress will be reviewed by the Department.
 - d. Rut depths measured on multi-lane roadways are for the outside truck lane. No distinction is made between studded tire wear and actual permanent deformation. The project team will consider both mechanisms in the study.
 - e. MtDOT personnel noted that the primary initiation of fatigue cracks is longitudinal cracking in the wheel paths. Actual fatigue cracking (alligator cracking) does not begin until much later in the service life of the flexible pavements. This may indicate that most of the fatigue cracking noted or observed in Montana maybe related to surface initiated fatigue cracks. This will need to be confirmed with field cores.
4. **Experimental Factorials.** The project team gave an overall review and discussion on the experimental plan and the factorials that were provided to the panel. The following provides a summary of the comments and suggestions made relative to the experimental plan and factorials.
- a. Full-depth or deep-strength pavements are not used that much in Montana. The more common structure is the conventional HMA pavements. The project team should focus their efforts on this pavement type.
 - b. Another pavement type that has been used more recently is in-place pulverization of existing HMA layers, adding additional aggregate base material and placing a new HMA binder and wearing surface. Another pavement type that is being used by the Department includes adding Portland cement to the recycled or pulverized layer. Different unbound aggregate base materials (varying amounts of silt and clay) are also used throughout the state. Thus, these different pavement and material factors should all be considered in the experimental plan. The Department provided tentative project locations for some of these pavement types.
 - c. Subgrade stabilization is not used in Montana.
 - d. Mill and fill is the common rehabilitation technique used in Montana. The project team overviewed the difference in terminology between rehabilitation of existing HMA pavements and reconstruction. For this study, the team noted that pulverization with or without adding Portland cement and placing a new HMA layer will be considered reconstruction and the part of the factorial identified as new construction. However, the reconstruction alternate with using existing pavement materials will be identified separately from the alternate with using completely new materials.
 - e. RAP is also used in many HMA mixtures and should be included in the experimental plan. The HMA mixtures with RAP are typically a type "D" mix. The percentages used are less than 45 percent, with most mixtures being at 35 percent RAP.

- f. HMA overlays of rigid pavements are very uncommon. The Department has used crack & seat of PCC prior to overlaying with HMA. However, Montana has so few miles of PCC pavements that it was suggested that this family of pavement be eliminated from the current experimental plan. It was suggested that this type of rehabilitation of PCC pavements be included only if time and funds remain.
 - g. Fabrics and other inter-layers are not used in Montana.
 - h. Subsurface drainage – Subsurface drainage layers to remove water from surface infiltration is not typically used in the construction of HMA pavements in Montana. It was suggested that subsurface drainage for surface infiltration not be included in the experimental plan, and was removed as a secondary factor.
5. **Coordination of Field and Other Activities.** The following summarizes and notes those items to be closely coordinated with the Department and others during the course of this project.
- a. Vince Janoo is completing a project for the Department. This work includes evaluating the deflection data measured on the 10 SMP sites established outside of the LTPP program. The Department gave permission for the team to contact Vince for obtaining the data and any analysis completed on that data.
 - b. The Department will be able to provide traffic control, assuming that there is sufficient lead time to schedule the traffic control activity with the maintenance districts. It was requested that a 2-week notice be provided as a minimum.
 - c. The Department will be able to provide profilometer and deflection testing for each non-LTPP test section that is added to this study.
 - d. The Department will conduct an extraction of the PMS database to identify potential sites for filling the factorial. This data extraction will be completed after the site selection criteria and general location and design features are provided from the team to the Department. The Department's PMS database uses ORACLE.
 - e. One important issue related to HMA properties and future testing was discussed – bulk samples of HMA mixtures from the SPS-9 project test sections. It was requested that bulk mixture samples in excess of 300 lbs. be retained for testing under NCHRP 9-19. MtDOT will determine the amount of bulk mixture available for testing.
6. After the general project meeting, the project team then met with specific Departments to discuss traffic, materials, construction, deflection, and PMS data availability for use of this project.

Action Items. The following is a brief listing of the action items resulting from this meeting.

- 1. **PB** – Identify the mix type for each of the LTPP test sections. The results from this action item will identify the missing cells in the experimental cell. After the HMA mix type has been identified for each LTPP test section, the factorial should be updated and submitted to the Department for review and comment.
- 2. **Fugro-BRE** – Review the location of the LTPP sites in adjoining states for possible application and use of supplemental sites for Montana. Submit this listing of potential supplemental sites to the Department for review. These supplemental sites will be noted on the experimental factorial.

3. **Fugro-BRE** – Revise the experimental plan and factorial for the Road Map and submit to the Department for review and comment. Revisions made to the experimental plan should consider the comments made during the discussion of the experimental plan and factorial. The revised factorial will identify the missing cells for which non-LTPP projects will be needed. The criteria for identifying the additional projects will be included with this submission.
4. **Fugro-BRE** – Contact Vince Janoo and discuss the SMP data and analysis of that data. Request data from Vince.
5. **Fugro-BRE** – Discuss traffic data with Mark Hallenbeck.
6. **Department** – The Department will use the PMS database to try and quantify the importance of those parameters tentatively suggested for use in the factorial, and to identify potential projects and the locations for the test sections. This will be completed after the Department receives the selection criteria from the project team.
7. **Project Team** – Submit the “final” experimental factorial to the Department, after the additional sites have been identified.
8. **Department** – The Department will measure FWD deflections using their equipment at the same time that Nichols Engineering is testing specific LTPP sites to ensure that there is no to minimal difference in the results. This activity will be completed after the first year’s data has been completed.
9. **PB** – Use field cores to determine the direction of crack propagation or initiation of fatigue cracks during the sample recovery process.
10. **MtDOT** – The Department will determine the amount of bulk HMA mixture from the SPS-9 project for testing in accordance with the test protocols developed under NCHRP 9-19.
11. **MtDOT** – The Department has made a commitment to obtain any missing materials test data under the LTPP project. The materials testing should be completed within the year.
12. **MtDOT** – The Department will communicate with the Pavement Design Task Force to obtain pertinent copies of the 2002 Design Guide reports and submittals for review. If there are questions relative to what information maybe available and important relative to this study, Harold Von Quintus should be contacted by the Department.
13. **MtDOT** – The research department will look at their experimental projects that have been completed or under study to determine if the availability of additional data for use in supplementing the experimental factorial for use in this study.
14. **MtDOT** – Fugro-BRE has requested the Department to provide a listing of the test procedures and test protocols that the Department will likely be able to implement in the future to ensure that the results from this project are consistent with their implementation plans (i.e.; the consultant does not want to recommend any procedure that cannot be implemented by the Department).
15. **MtDOT & Fugro-BRE** – Both the Department and consultant will prepare and exchange a contacts listing for this project.

Project Title: "Performance Prediction Models"
Montana DOT Project No.: HWY-306041-DT
Fugro-BRE Project No.: 3074
Date: June 28, 2001

**Preliminary Meeting Agenda
July 2, 2001**

Location: Montana DOT Offices

Purpose of Meeting: An introduction and kick-off meeting to coordinate future activities on the project with Department personnel, establish lines of communications, and determine proper communication protocols when requesting data and information on specific projects to be included in the study.

1. Introductions
2. Overview of the Work Plan
 - a. Task Identification
 - b. Experimental Plan
 - c. Schedule
3. Coordination/Communication of Project Activities
 - a. Contacts
 - b. Lead Time
 - c. Identification of Additional Experimental Projects
4. Data Requests
 - a. Long Term Pavement Performance Test Section Data
 - b. Pavement Management Data
 - i. Distress
 - ii. Deflection
 - iii. Ride Quality
 - iv. Cross Sections, Section Identification
 - c. Traffic Data – Measurement Sites, Frequency
 - d. Design and Construction
 - e. Materials
 - f. Maintenance
5. Concerns or Issues from the Department
6. Additional Discussion Items
7. Adjourn